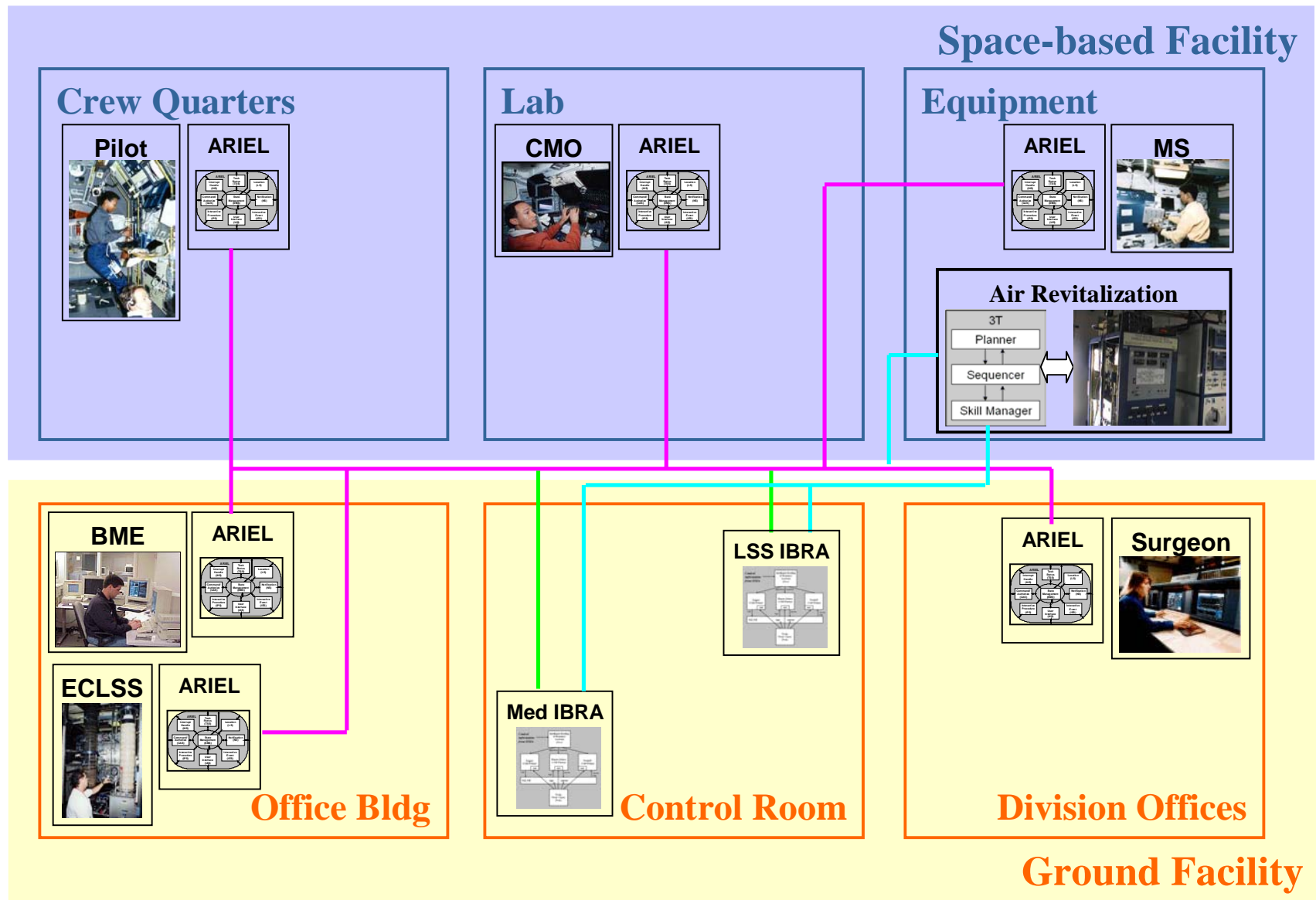# Agents for Distributed Team Operations (ADTO)

Project Overview

- Objectives
- Approach

Agents for Distributed Team Operations

Supporting Teamwork

- Supervisory monitoring
  - Departing from vigilant monitoring by humans requires ability to
    - Focus users attention when something important happens
    - Provide remote access to summaries of events after they occur
  - Approach: use ARIEL notification to draw users attention to events and notices provided by web-based Team Work Center
- Team coordination based on awareness of others
  - Distributing operations requires support for coordinating actions with other team members
  - ARIEL models roles, activities, location, and health of its user
  - Approach: make state changes of other team members visible to user within ARIEL agent
- Humans and agents working together
  - Human-agent teams must reason about the same information
  - Approach: provide information management tools (Logger, ReportMaker, WorkIT) that can be manipulated by both humans and software agents

Supporting Teamwork

- Management of some team member states by the organization
  - ARIEL agent serves a single user
  - Some users need to be able to alter the state information of other team members
  - Approach: extend ARIEL to assist authorized users in updating user states managed by the organization (role assignment, crew health)

Supervisable Agents

- Adaptable Agent: configurable services in ARIEL
  - DCI provides the right set of services
  - Different organizations utilize different services (e.g., ground controllers versus crew)
  - Approach: be able to execute ARIEL agent with a subset of the available services active
- Customizable Agent: notification specifications in ARIEL
  - Information needs of users change with the roles they support
  - How to notify the user depends upon role and accessibility
  - Approach: provide notification specifications that define
    - What notices are of interest for each role in organization
    - How salient the notification is and what interface mechanism is used
- Customizable Agent: briefing response instructions (BRI) in IBRA
  - Each flight discipline has standard events that are logged and reported
  - Written instructions are used to assist manual detection and reporting of these events
  - Approach: provide graphical editor for creating BRIs that can be executed to automatically detect and report events

Supervisable Agents

- Communicating Agents: interaction between ARIEL agents and IBRA agents for improved human situation awareness
  - Approach
    - IBRA logs and reports ARIEL notices in ground formats
    - ARIEL notifies user of messages from IBRA
  - Lesson: use of CORBA and XML message content resulted in quick integration

Requirements for DCI Application

- Domain models for DCI application
  - Service configuration
  - Roles
    - Role ontology
    - Notice directives for each role
  - Events
    - Event onotologies
      - Domain categories (e.g., ars, medical)
      - Notification categories (e.g., alarm, alert)
      - Event categories (e.g., domain event, user state event)
    - Pre-defined event templates (e.g., medical emergency)
  - Location
    - Location ontology
    - IP to location mapping
  - Plan management
    - Activities for users with plan management
    - Activity to procedure mapping

Collaboration with RIACS

- Integration of our procedure capability with RIACS Dialog Systems software
  - Start with simple Nuance voice recognition developed at JSC for hands-off display navigation
    - Hard-coded grammar and semantics
    - No voice feedback or confirmation
  - Extend to include RIACS Dialog Systems software
    - Generality and reuse by generating grammars and learning semantics
    - Robust voice recognition by supporting feedback and confirmation
  - Issues
    - Adapt XML representation for procedures to support voice systems
    - Integrating voice system with CORBA

Collaboration with <MERBoard>

Status

- Hardware procurement and software installation
  - 6 Dell Inspiron laptops and 1 Motion Computing tablet procured
  - Reuse Sharp Zaurus handhelds procured by DCI
  - Software installation is in progress
- Capability development
  - Procedure display software is complete
  - ARIEL agents for ground controllers
    - Revision of software for configurable service set complete
    - Modeling for ADTO scenario in progress
  - DCI upgrades
    - Service upgrades complete
    - Display development in progress
  - HCAAST IBRA
    - …..
  - HCAAST upgrades
    - …….
  - ISMA agent using case server developed under HCAAST project
    - Port to Linux in work

Status

- Testing
  - Integration among HCAAST IBRA, DCI ARIEL, and procedure display software is complete
  - Integration with ISMA in work
  - Integrated testing with scenario to begin early September

Procedure Execution Support

- Web-based support for manual execution of procedures
  - Display procedure steps
    - Organized into sections and tasks for lengthy procedures
    - Provides graphical navigation aid that reflects where you are in procedure
    - Includes detailed visual help
  - Log and distribute data collected during execution of procedure
    - Used to track manual activities in DCI
    - Used for automatic logging and reporting of crew activities in HCAAST
  - Tracks progress through procedure
  - Easily extends to commanding via a web interface

corba

Server

IBRA   **ARIEL**
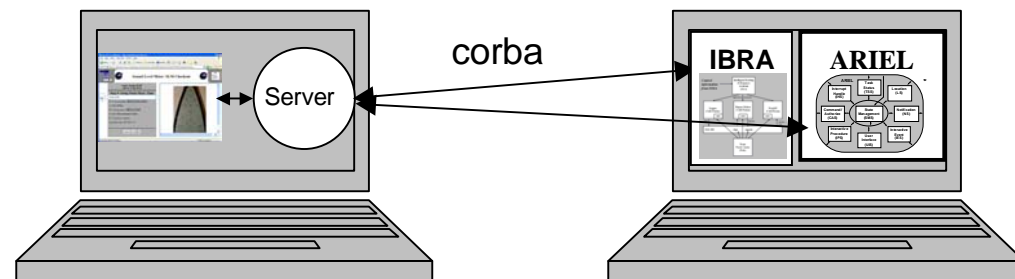
- Future Work
  - Voice navigation of display for hands-off use
  - Serve next procedure step based on automated reasoning about step preconditions

Overview of SLM Procedure
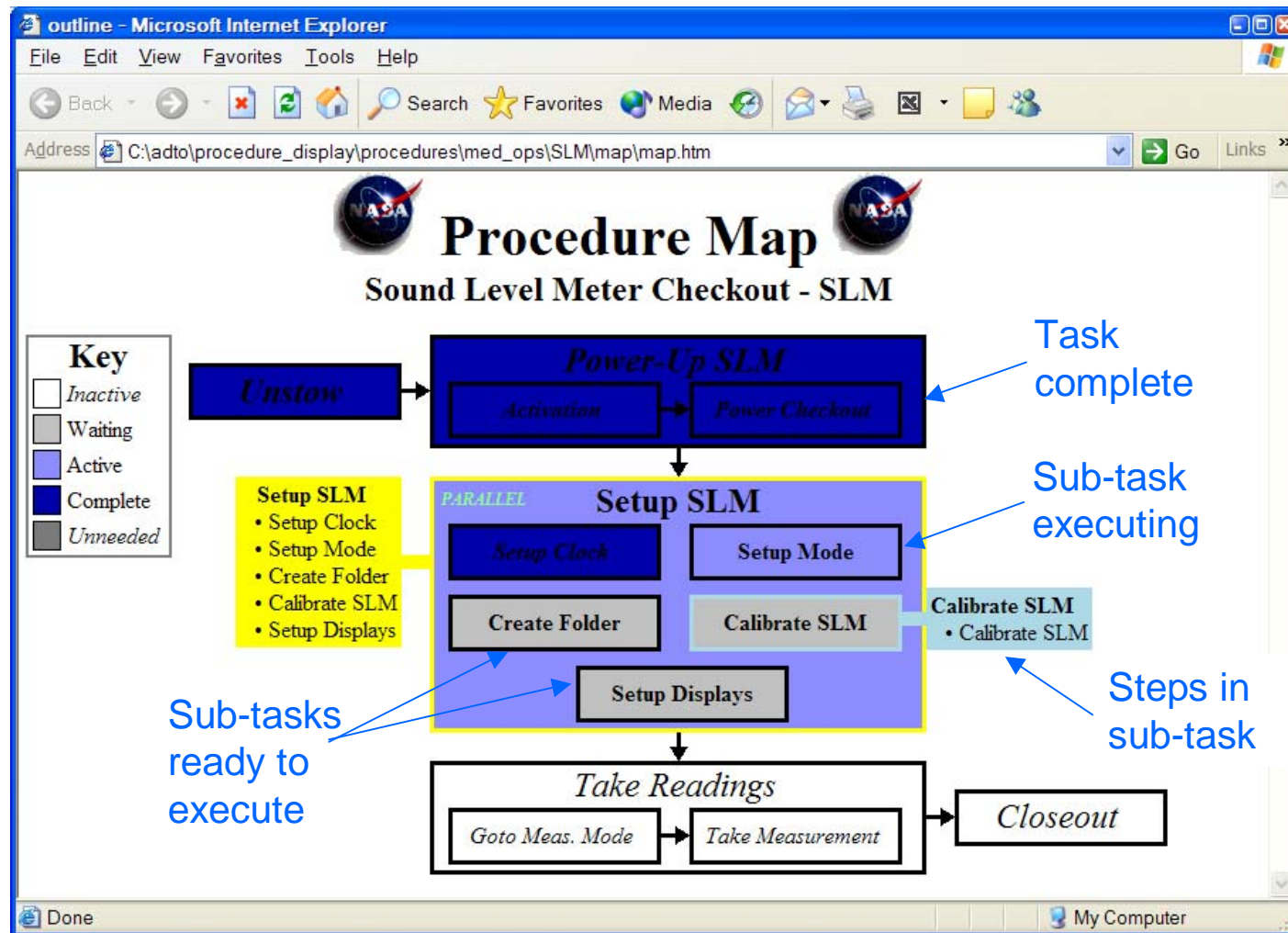
Step of SLM Procedure

Procedure Overview

Procedure TOC

Graphical help for step

Current step

Step complete?

Collecting Data for Inhalation Injury

Downlist symptoms when observed

Downlist vital signs periodically

Keep history of readings

Proposed Follow-on Work

- FY04
- FY05
- FY06